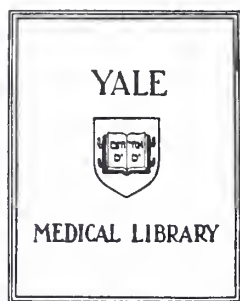




THE CHANGING ROLE OF ELECTIVES
IN UNDERGRADUATE MEDICAL EDUCATION

Paul Dodge Gagliardi

1984



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THE CHANGING ROLE OF ELECTIVES IN UNDERGRADUATE MEDICAL EDUCATION

A Thesis Submitted to the Yale University
School of Medicine in Partial Fulfillment
of the Requirements for the degree of
Doctor of Medicine

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PREFACE

The beginning medical student, relieved to be through with the competition of the admission process, willingly enters an educational system considerably more rigid than that to which he is accustomed. The student is told by administrators, faculty, and peers that because of the unique responsibilities of the medical profession, no other educational system will suffice. A critical observer is struck by a grand contradiction in this assertion. The student is to be trained to accept great responsibilities, yet he cannot be allowed to take more than a small amount of responsibility for his own education.

As a student in a medical school which allows considerable flexibility and individual responsibility, I have been surprised by the powerful presence of this contradictory assertion, which seems able to persist even in spite of institutional policy.

Medical curricula in the United States contain varying amounts of elective courses and free time. The process by which a school decides how much time to devote to these two areas, both of which allow the student to exercise free choice, should demonstrate how the basic conflict between individual responsibility and institutional responsibility is addressed. I believe that by studying this process and by identifying the role of electives in the medical curriculum, the forces which have set up this conflict can be identified.

The form taken by medical education is of concern not only to students, faculty, and administrators. Society at large is concerned, at an individual level in patients' interactions with their physicians, and at an institutional level in terms of government's financial support

and regulation of the medical education system. The cost of medical education is high in terms of money, time, and effort. Although no one has been able to show a definite relationship between the quality of medical education and the quality of medical care, common sense would suggest that the former must have some effect on the latter. Yet, the process by which medical education acquired its present form is relatively obscure.

I hope to illuminate this process by addressing the following questions about the role of elective courses in the undergraduate medical curriculum:

1. Since the Flexner Report, what theories about the role of electives have been proposed, and how have they been accepted or rejected in practice? The amount of time devoted to electives, the types offered, and the ideas of medical educators will be described.

2. How have electives been used in certain individual medical curricula, and have the results reflected the goals? Four schools (Case Western, Duke, Stanford, and Yale) will be considered. These four were chosen because they have all dealt with the role of electives as part of carefully planned educational programs seeking to remedy the perceived deficiencies of medical education in various eras. In each case the ideas and goals used in the design of these curricula have been recorded, and there are at least descriptive evaluations of the results. Having had the experience of being a student at Yale, and having had the opportunity of speaking with people involved in the planning process, I have a special interest in the role of the elective program at Yale.

3. How are electives involved in larger issues facing medical education and what role can the proper use of electives play in improving

medical education and medical care? Current proposed changes will be evaluated in the light of the historical evidence presented.

Certainly, other questions about electives could be posed, but I believe that the consideration of these will address the basic issues, and that they are well served by the material available to me.

INTRODUCTION

The reform of medical education initiated in 1910 in response to Abraham Flexner's Medical Education in the U.S. and Canada serves as a starting point for this investigation.

Flexner's study, commissioned by the Carnegie Foundation for the Advancement of Teaching at the urging of the recently organized American Medical Association Council on Medical Education (1) had the intent of revealing to the profession and the public the large number of medical schools in existence and the variable quality of the educations they provided. Of the greater than 100 schools studied a very few were in the mold of Johns Hopkins, with strict admission requirements, rigorous basic medical science teaching in a university setting, and practical clinical training in a teaching hospital; a few dozen were proprietary, profit making ventures with no admission standard other than the payment of fees, virtually no laboratory or clinical facilities, poorly trained faculty, and minimal standards of performance. The balance of the schools were of mixed quality, with admission requirements ranging from some high school to two years of college, with university affiliations of often doubtful value, with variable physical facilities, and with clinical material provided by the local medical community.

Flexner's basic idea was to place medical education on a rigorous scientific basis. Only students with scientific aptitude and suitability of character determined by two to four years of college experience would be admitted. For two years they would study the basic medical sciences (anatomy, physiology, biochemistry, pathology, pharmacology,

and microbiology) in a scientific university setting. This would be followed by two years of bedside, practical experience in a teaching hospital, when the scientific method learned in the first two years would be applied to clinical problems. Dogmatism and empiricism were to be swept aside by scientific medicine. The main educational method employed previously, the lecture, was to be replaced in the first two years by the laboratory experiment, and in the second two years by responsible clinical experience based on scientific principles (2). Acquisition of the scientific method would equip the student with the means of continuing his self-education after medical school (3). Application of the scientific method to clinical problems would assure the future of truly scientific medicine.

The report had almost immediate impact. Support came from public opinion, the conscience of the profession, the Council on Medical Education's annual reports, and from changes in state licensure standards (4). Lippard describes the rapid changes that followed:

During the next ten years, 46 of the 131 schools then in existence closed their doors or were absorbed by stronger institutions. Others were strengthened by merger, by university affiliation, and by the infusion of support of private foundations and the state governments. (5)

Flexner's recommendations for the form of medical curriculum were accepted almost universally in the United States' medical schools by 1920 (6) and his basic design has persisted to this day, with only minor modification.

In the ensuing years there has been a rapid expansion in biomedical knowledge both in the basic and the clinical sciences. Traditional fields such as biochemistry and physiology have expanded their fund of knowledge relevant to medicine, and new fields such as molecular

biology, or previously minor fields such as behavioral medicine and public health have demanded a part of the medical curriculum. The effect has been a progressively increasing strain on the traditional container, resulting in a crowded and inflexible curriculum. Crowding and rigidity, noted as early as 1925 by Flexner in his reassessment of U.S. medical education (7), have been recurrent criticisms in virtually all subsequent appraisals of the medical curriculum.

Initially medical educators dealt with this problem in two basic ways. They increased the length of the medical school year from about 32 weeks per year in 1920 to 36 weeks or more plus one or two summers by 1970 (8), and they revised the share of curricular time devoted to different subjects based on prevailing attitudes of their relative importance. Older and more static subjects such as anatomy grudgingly gave up time to new subjects such as molecular and cell biology. However, both of these strategies are conceptually limited in their ability to be used repeatedly; in the first case by the fact that there are only so many weeks in the year, and in the second by the fact that although time may be infinitely divisible, the student's interest and attention are not.

A more permanent solution to this problem required abandonment of two basic assumptions; the first, that undergraduate medical education could somehow be comprehensive, teaching the student all that he might need about the basic and clinical sciences, and the second, that medical school would provide the same basic education for all physicians.

The reforms at Western Reserve University challenged the first in 1952. Lippard writes that:

. . . a curriculum was developed which abandoned all thought of total coverage. Emphasis was placed on basic concepts; the mechanism of disease; continuing self-education; the development of scientific critique; the cultivation of skills; and the inculcation of ideals. (9)

The second assumption was challenged in 1965 by Duke, with the introduction of a program which compressed the content of the traditional four years into the first two, and followed this by two years of entirely individualized education.

Both of these programs are to be discussed in detail later. The point to be made here is that the success enjoyed by these two schools after the rejection of these two assumptions encouraged other schools to allow students at least some opportunity for free choice and individual responsibility in their educations. Surveying U.S. medical schools in 1972, Lippard noted a fourth year comprised primarily of electives at almost all schools. (10)

As will be shown later, these opportunities often go unused or are used in only the most conventional manner. Curricula which are in theory quite flexible often result in education quite similar in form to those of fifty years ago; that is, two years of basic science roughly equally divided between the normal and the pathological, followed by two years of clinical experience, half devoted to general clerkships and half devoted to subspecialization. Educational rigidity, if not imposed on the student by the institution, is imposed by the student himself. It seems that individual responsibility and free choice are intrinsically at odds with medical education.

The history of this strained relationship can be followed by a more specific investigation of the role of free choice in the medical curriculum, exemplified by the changing role of elective courses and free time.

HISTORY

I

When Flexner re-examined U.S. medical schools in 1925, fifteen years after his influential report, he was surprised by the uniformity of U.S. medical education. The clearly bad schools described in 1910 had disappeared, but many institutions in their zeal to reform, had put more emphasis on adopting his proposed curricular design than in embracing his basic principles. Flexner saw that two polarized classes of schools had emerged. Of the 2500 or so graduates produced in 1925 by 80 schools, 1700 were from 60 odd institutions, described by Flexner as;

. . . varying but slightly from one another, through each of which during four years they moved in lockstep. They were grouped in fixed classes, the personnel of which was practically unchanged, except for outright losses due to failure, from year to year; they followed in fixed order, day by day, the same subjects, for the same length of time, in the same year at the same hour. From 8:30 to 1:00, from 2:00 to 4:30 all students in their respective classes pursued an identical routine. And at regular intervals, all alike, in the same rigid groups, performed precisely the same practical exercises, attended the same quizzes and submitted the same monthly, semi-annual, and annual examinations. Anything more alien to the spirit of scientific or modern medicine or to university life could hardly be contrived. (11)

The curricula of the sixty-odd schools are constructed and administered on the assumption that the definite items that constitute medical education can be formulated, combined, and in a fixed period communicated to the members of a group that hardly changes from year to year. (12)

In contrast to these schools there existed another group of dozen or so of the best schools, accounting for about 800 graduates, which allowed the student to take some responsibility for his education. (13)

Flexner noted two ways in which this had been done: by the use of "required" elective and by the introduction of truly voluntary courses. (14)

The first, also known by the names "selective" or (confusingly) "elective," requires the student to choose a certain number of courses from a larger number of offerings. The effect of this can vary depending on the number of choices required and the total number of offerings. Saying to a student, "From the following list of twenty courses pick three" is very different from saying "Of the following twenty courses pick eighteen." Thus, the time devoted to this type of elective can be a poor indicator of curricular freedom.

On the other hand, the presence of some entirely voluntary courses, and the free time necessary to take them, indicates an institution willing to let the student take significant responsibility for his education. This freedom, long a part of the English tradition of university advanced study, was noted by Flexner to be present in varying degrees in European medical schools, with beneficial effect. In his 1925 survey, Flexner made this observation of the German curriculum:

The student enjoys a large measure of freedom and responsibility. He may within limits make up his own combinations; he has every inducement to exceed the required minimum at every point at which his interest has been aroused, and the better do. Moreover, students do not usually construct for themselves identical curricula; they have not had precisely the same experience, nor do they know precisely the same things. (15)

In contrast, in America; in a four year curriculum of 32 weeks per year and forty hours per week, of a potential total of 5120 hours, the amount of time scheduled in 1925 for required courses ranged from 3979 hours (at Yale) to 4896 hours (at the College of Medical Evangelists. (16)

Flexner was dismayed:

A student staggering under such a burden cannot, except sporadically, stop to read, work, or think at random. Thus the profession which least depends on mere "learning lessons,"

and most on initiative and interest, carries on its training without reference to the development of independence and resourcefulness. (17)

Flexner identified three reasons for the relative inflexibility of the American schools.

1. A "national fondness for organization."
2. Poor or inconsistent secondary and college preparation of the pre-medical student, which the medical school attempts to correct by "employing selected methods of discipline, however repugnant to its spirit."
3. Fear of re-emergence of the low quality schools of the past. (18)

The first of these scarcely could have been used to distinguish the United States from the European countries, but the second and third were probably true, and Flexner saw his own report of 1910, and medical educators' subsequent enthusiasm for reform, as the basis of the third:

Our present fetters were therefore forged in order to compel wretched medical schools to give unfit medical students a "better" training. Now that this end has become measurably accomplished the means have become a fetich, blocking further improvements. (19)

It is clear from the 1910 report that Flexner never intended this. He had pointed out that the better schools, such as Harvard and Johns Hopkins devoted about one-fourth of the total curriculum time to free-choice electives, and that to plan every moment and include every subject in the curriculum was neither necessary nor desirable. (20) In fact he saw a rigid curriculum as the mark of a weak school: "The prescribed curriculum is a staff upon which those lean who have not the strength to walk alone." (21)

Given the very poor condition of U.S. medical education prior to 1910, it is not surprising that the reformers put great emphasis on instituting the powerful mechanisms of rapid and effective revision suggested by Flexner. However, they either lost sight of, or did not

agree with the basic principle Flexner sought to establish; that is, that the function of medical schools should be to educate the student in the scientific method and then allow him to apply it to clinical problems. Medical educators assumed that if a school had an endowment, a university affiliation, a teaching hospital, experienced basic science teachers and high admission standards, all features generally accepted as necessary for reform (22), then the goals of reform must have been well served. Flexner pointed out in 1925 that this was not necessarily true, and that based on his knowledge of European medical education, American education could be further improved.

However, the 1925 survey, more thoughtful and analytical than its predecessor, caused no great clamor for further reform. The lurid details of the workings of abysmal institutions in the 1910 report had given medical education a wide audience. In 1925 Flexner's audience consisted mainly of medical educators, few of whom seemed to have any desire to change the system they had so recently created. For example, a reviewer of 1925 missed Flexner's point entirely. This review makes no mention of the educational rigidity and uniformity noted in the book, but rather faults Flexner for ignoring the issue of whether medical students should know Greek and chides him for not mentioning the "new" interest of organized medicine in public health and the "social content of the physician's services." (23) As will be shown, this reviewer's emphasis on content as the main issue concerning medical education, with little concern for the process, becomes the recurrent theme for most discussions of medical education for the following thirty years.

II

During the two decades following the 1910 report, the Association of American Medical Colleges (A.A.M.C.) became the major determinant of the form and content of the medical curriculum. Formed in 1890 by a few of the better schools, A.A.M.C. grew rapidly during the reform period, and by 1926 its membership included most medical schools. (24)

By making recommendations about the pre-requisites for admission to medical school, and by endorsing a certain curricular design, the Association hoped to determine the type of student admitted and the form and content of his education. During the 1920's, non-compliance with A.A.M.C.'s standards would only lead to possible loss of membership. The school could, by meeting the requirements of the particular state's medical practice laws, continue to award the medical degree. However, many schools, having recently reorganized themselves in response to outside pressure, might have felt a need for the institutional legitimacy conferred by membership.

Finally, in 1930, A.A.M.C.'s grip on medical curriculum acquired indirectly the power of law. At the 1929-30 meeting of the Federation of State Medical Boards it was resolved:

That in each state the medical practice act and its administration conform as far as possible with the educational principles of the Association of American Medical Colleges. (25)

The state boards collectively had given A.A.M.C. responsibility for setting standards and monitoring performance. What specifically were these standards?

In 1926, in the first volume of its Bulletin (which later became The Journal of Medical Education), A.A.M.C. recounted its prescriptions

for the medical curriculum. (26) Prior to 1919 it had specified the required courses, their sequence, the hours allotted to each, and the method of teaching (lecture, laboratory, or clinic) to be employed. In 1919 the plan was revised so that rather than fixing the number of hours per course, the total number of hours was fixed with each course allocated percentages. Schools were allowed the option of changing a course's time allotment by plus or minus ten percent of its total. In 1923, requirements for the methods of teaching, by then well established, were dropped.

By 1926, the recommended curriculum consisted of from 3600 to 4400 hours, divided equally over four years. If a school adopted the minimum recommended percentages for all courses, which was extremely unlikely, then 24% of class time was potentially "elective." No distinction was made between voluntary electives and required electives.

Two points need to be made. The first is that A.A.M.C. recommendations about curriculum were regarded by schools as minimal, to be added to as each school saw fit. When Flexner surveyed medical schools in 1925, virtually all had from 4000 to 5000 prescribed hours. (27) Electives were rare, and usually of the required type. (28)

The second point to be made is that, with a very few exceptions, A.A.M.C. saw the process of curricular planning mainly as that of periodically adjusting the minor details of grand, fixed scheme. Although it allowed certain of the better schools to undertake experiments in 1926 (29) and formed a commission to study the educational process in 1925, the bulk of A.A.M.C.'s concern, as evidenced by its publications, centered around details of course content and schedules. Flexner's admonition of 1925 was unheeded:

The notion that the student can be kept from forgetting his anatomy, physiology, or pathology if only the proper curricular arrangement can be his on is doomed to disappointment. (30)

Medical educators seemed generally more interested in finding such "proper arrangements" than in addressing major conceptual issues, such as whether a student should be required to take some responsibility for his own education. For example, a "new" curriculum, designed in 1927 by the A.A.M.C. secretary with the goal of reducing required hours, differs from the 1919 model in only the most minute details. (31) What looked like change to those involved in 1927 looks like stasis to an observer today.

Given the conservatism and given the defensiveness of most of the member schools, A.A.M.C. was not in the position to initiate significant curricular reform. Its only gesture in this direction was the 1926 decision to allow certain schools to experiment with their curricula and "still not lose cast with the association." (32) However, this act was less an endorsement of the idea that change was necessary than it was a concession to the medical schools of powerful, well established universities, allowing them to conduct their programs in ways more consistent with the goals of the parent institution. These "experiments" (A.A.M.C.'s term) of the 1920's were generally of two types.

The first type, introduced at both Harvard and Johns Hopkins in the late 1920's, retained the concept of the four year, prescribed curriculum, but increased the student's freedom of choice by reducing the amount of required work. The established structure was retained but the student was allowed control over some significant share of its contents.

At Harvard, the first two years were conventional but during the third year two half days per week were left free, and during the fourth year the student was allowed to structure his time according to some plan initiated by the student and approved by a tutor. (33)

At Johns Hopkins, by condensing the traditional courses, the required part of a 5148 hour curriculum was reduced to 2636 hours, allowing some 2360 hours to be used as the student chose. (34) The first two years were primarily class work and the last two were primarily individual work. Free time was arranged in blocks, so the student would have the opportunity to travel to other institutions or work in a particular department for a significant time.

The second type of "experiment" was to operate the Medical School as part of a university graduate school, the traditional features of graduate and professional education somehow co-existing. This latter route was taken by the University of Chicago and by Yale where the M.D. degree was awarded after requirements for course work and residence were met, comprehensive examinations were passed, and a thesis was approved. No particular sequence of events or time limit was prescribed. With the exception of the time spent in clinical clerkships, medical students would share courses with students seeking other degrees. In theory, there was no limit on a student's free time or elective opportunities. In practice, however, as an outside reviewer of both programs noted in 1930, the programs could become quite conventional. In reference to Chicago:

. . . it is evident that the time required to complete the required courses left little time for elective work unless the student was willing to extend the time usually necessary to meet the requirements for the M.D. degree. This is especially true in the first half of the course of

study, and results in the students arranging their course of study along conventional lines of the usual curriculum. (34,35)

At Yale the same criticism applied, especially to the first two years, when over 2000 basic science hours were required. The Yale plan will be discussed in detail later, but a point can be made now concerning the graduate school plans. Although these programs allowed great potential freedom for students, this opportunity was only exploited by some. If the profession or public conveyed to a student at a liberal institution the notion that his education was necessarily four years long and necessarily contained certain experiences then his chances for a truly individualized education were diminished.

The fact that many students put liberal opportunities to little use caused the conventional schools to have an understandable lack of enthusiasm for such programs. Although some of the "experiments" of the late 1920's continued as the basic educational policies of the particular schools (as at Johns Hopkins and Yale), they had little effect on the operation of the bulk of medical schools.

Thus the period of 1930-1952 saw no great interest in significant educational reform. With the growth of biomedical research, supported first by foundations and later by the federal government, there was a rapid increase in information in both the basic and clinical sciences. The main issue facing medical educators was how this new content could be added to the established curriculum. The basic paradigm was assumed to be unchangeable. This situation prevented any growth of student responsibility and caused elective opportunities to shrink. For example, at Duke in 1930 elective time amounted to 46% of the total hours. This slipped to 17% in 1940 and 3% in 1950. (36)

Although planners did increase the school year and reallocate the time devoted to more obsolete subjects, they saw elective and free time as convenient, undefended sources of curricular hours, hours which could easily be filled with new and apparently necessary material. During this period, several organizations undertook large-scale studies of the medical education system, and all gave at least brief consideration to the role of electives.

In 1932, A.A.M.C.'s Commission on Medical Education, formed in 1925, issued its final report. This report seems very political, and although it clearly states the issues regarding electives, its recommendations are contradictory. Addressing the inflexibility of the curriculum, the report states:

The various efforts made to establish uniformity in medical education . . . , the almost frantic attempts to put into the medical course teaching in all phases of scientific and medical knowledge, and the tenacity with which traditional features of teaching are retained have been responsible for great rigidity, overcrowding, and a lack of proper balance in the training. Attempts to correct the difficulties have been largely directed toward rearrangements of the curriculum.

In medical education, as in other forms of education, attention should be directed more to the development of the individual student than to details of the curriculum. (37)

However, the authors of the report did not interpret liberal use of electives and free time, or the "graduate school plan" to be the means of achieving this end. Conceding that many students could profit by a "reasonable degree of responsibility for their own training," (38) the need for caution against too much freedom was expressed, as were the "dangers of superficial, undisciplined training, lack of unity in courses, dissipation of energy, and too early specialization." (39) The

report presents no hard evidence for these dangers, and in retrospect they seem more imagined than real.

The "graduate school" plans of Chicago and Yale were criticized on the grounds that:

. . . about ninety percent of the students elect courses which finally represent very much the same subjects of instruction which are given in most medical schools, although in this plan the student assumes a large degree of responsibility for working out his own curriculum. (40)

The reporters saw content as the prime issue, and did not recognize the possibility that a student who freely chooses certain courses might have a different educational experience from a student assigned to those same courses. Even more troubling was their judgment that students appeared to be "incapable of pursuing their medical training independently" (41), as it could not be assumed that their earlier experiences prepared them "to make intelligent choices of electives or to use their free time profitably." (42)

How exactly students would acquire the ability to make intelligent or take serious responsibilities was not addressed, and the need for this learning process to be included in the more supervised years of medical training was not realized. In the Commission's view, medical education's problems could be solved by changing some of its teaching methods. (43) Required lectures and demonstrations could be replaced by required seminars and conferences. The student's passive role in the transfer of information might be changed, but his passive role in the process of shaping his education would stay the same.

In 1940, the Council on Medical Education and Hospitals of the American Medical Association (AMA) issued a study, Medical Education in the United States: 1934-1939. Largely a restatement of the criticisms

made in 1925 by Flexner and in 1932 by the A.A.M.C. Commission, the authors of the report do make two interesting points. In its discussion of educational objectives, the report states that an educational program must necessarily be "non-comprehensive," serving as a foundation for future development, and that those programs perceived to be the best were "the most flexible." (44) So, even a conservative group like A.M.A. could recognize the futility of the attempt to make undergraduate medical education comprehensive. Also, a link between quality and flexibility was noted, although the role of electives in this flexibility was not described.

In 1953 the Committee on the Survey of Medical Education, jointly sponsored by A.M.A. and A.A.M.C., issued its final report. Formed a few years earlier with the goals of analyzing and defining "the status of medical schools as social and educational instruments of modern society," the commission had as its director John E. Deitrick, Associate Professor of Medicine at Cornell and as its associate director Robert C. Berson, Assistant Dean at the University of Illinois. (45) Although largely an example of the American medical establishment singing its own praises, the report does recommend that as a basic premise, the medical curriculum should be devoted to student needs and not the student to curricular needs, and that free and elective time be increased. (46)

In each of these three surveys, electives were given minimal consideration, reflecting their actual stature in medical curricula during this period. However, all three reports indicate that the idea of the potential value of electives was still alive. From 1952 to the present, this latent potential has been recruited by medical educators to serve

a wide variety of goals in the many attempts at reform which characterize this period.

III

The most dramatic of these attempts at reform began at Western Reserve University in Cleveland in 1952. It was the first instance since the 1920's of a medical curriculum being completely re-designed from beginning to end. (47) By rejecting the notion of comprehensiveness, the reformers could emphasize the basic principles of medical education and dispense with many of the details. Prior to this time, the goal of most schools was to produce an all-around physician capable of either entering general practice after one year of internship, or a specialty after several years of residency. Here, the goal was to produce an undifferentiated physician, trained in the scientific method, experienced in the basic clinical disciplines, and equipped with the means of continuing self-education. This education would serve as the foundation for further post-graduate training in the student's area of interest. This educational experiment is best remembered for the use of a new educational method; integrated, interdisciplinary teaching of the basic sciences, a feature later adapted at least in part by many other schools. (48)

The theoretical role of electives and free time in this program was complex, and will be discussed in detail later. In purely descriptive terms, these opportunities were used in two ways. During the preclinical years, 12 hours of a scheduled 44 hour week were left free. (49) The student and a tutor planned the use of this time according to the student's needs. (50) During the clinical period 32 weeks were left free,

in blocks, to be used for electives, research, or whatever was chosen by the student. (51) This method of allocating free time, in small bits in the pre-clinical years and in large blocks in the clinical years, has been widely used subsequently. It was sensible and easily applicable to almost any number of individual or institutional goals.

It is the emergence of this multiplicity of goals, for both students and institutions, which characterizes medical education since the 1950's. Schools embarked on programs of curriculum reform serving widely divergent ends. Programs were developed to produce more scientist-physicians, more broadly educated physicians, and more primary care physicians. In addition, during this period the issue of health manpower arose, and programs were initiated, expanded, or reorganized with the goal of simply producing more physicians. A school could conceivably find itself being encouraged by the federal government to increase the number of students, by state government to produce more family physicians to practice in the state, and by the faculty to produce medical scientists in their own images. Flexible curricula, making liberal use of free time and electives, could serve, or at worst appear to serve, these various goals. The first of these new missions to be taken up by medical schools was that of producing the physician-scientist.

IV

The advances in biomedical research achieved during World War II under the Office of Scientific Research and Development created the consensus that federal support of biomedical science was necessary. (52) Through the growth of the National Institute of Health, support for

research and research training at medical schools increased during the 1950's and early 1960's. Three examples of how free time and electives were used to serve this new mission exist in the programs instituted at Johns Hopkins and Stanford in the late 1950's and at Duke in the mid 1960's.

The program at Johns Hopkins had three features which encouraged students to develop careers in basic science research. (53) The first was that students could be admitted after two, three, or four years of college, thereby allowing a student to spend a year or more in research and yet still begin earning a living in research or in practice at the same time as his peers at other schools. The second was that basic science subjects were taught in intensive ten week blocks with much concurrent free time, encouraging the student to investigate these subjects in depth. Finally, during the last three years of the five year program, ten weeks per year were allocated to projects initiated by the student under the guidance of a particular department or preceptor, with basic science projects being strongly encouraged. (54)

The Stanford program, although not aimed specifically at producing more physician-scientists, did incorporate the means of accomplishing that goal. In 1959 the clinical departments of the medical school were moved from San Francisco to the university campus at Palo Alto, and a newly designed five-year program was instituted. The basic idea was that a sharply defined core of medical knowledge would be complemented by liberal free time, to be used by the student without restriction for research, electives, or any other offerings in the university. In practice, during the three pre-clinical years, half of each day was devoted to basic science courses and half was free, and students with research

interests made valuable use of this time. (55) The basic idea was so successful that the plan was revised in 1967 to become even more flexible.

The Duke curriculum, although instituted in 1965, at a time when Federal interest in medicine was changing from research to application, originated in the research oriented climate of the late 1950's and early 1960's. Basic science faculty, such as Philip Handler, a biochemist, realized that the traditional curriculum was not only overly crowded and rigid but that it was in many ways anti-scientific. Students did not have the opportunity to prepare for the variety of careers then becoming available, they did not study any one area in depth, and they viewed the basic science years as an intellectual hurdle rather than a foundation for later study. (56) The goals at Duke were to have the student realize the value of the basic sciences and to allow him to acquire a unique education suited to his particular needs.

The first year was devoted to the essential core of the basic sciences, with details largely eliminated. This was followed by a year of required clinical clerkships, similar to the typical third year. The third and fourth years were entirely individualized, the student designing a program incorporating course work and research in both the basic and clinical sciences, under the guidance of several advisors.

Conceptually, the plan was very satisfying, for it gave equal weight to the notion that there exists a core of material which all physicians need to study and to the idea that the individual should take significant responsibility for his own education. In practice, however, the difficulties in working out such a plan were considerable, and they will be discussed in detail later.

Within five years, most other schools adopted Duke's general structure, (57) and schools with varying resources and goals modified this curriculum to their needs. At best their respective curricula would retain the large share of individualized education allowed at Duke; at worst it could become, by incorporating a two year basic science "core" and a fourth year of required clinical electives, merely a repainted version of the 1919 model.

Although research oriented schools such as Duke continued to receive generous Federal support in terms of research grants, the changes in government policies of the mid-1960's gave many other medical schools a new mission. The N.I.H. budget no longer grew at 15 and 20 percent per year, and the federal government, by passing the Health Professions Education Act of 1963 and the Medicare Act of 1965, assumed the roles of supporting medical education and actually delivering health services. (58)

V

During the mid-1960's, there was the increasing realization that in order to meet the medical needs of the disadvantaged members of the "Great Society" more health care resources were required. The assumption was made that more health care required more physicians. Although there was little hard evidence to support this assumption, it was widely accepted by legislators, medical educators, and the public. The origins of this assumption, the reasons for its acceptance, and its long-term implications for medical economics and medical care are beyond the scope of this paper. Policies based on this assumption, however, clearly affected the curricular role of electives and free time. This can be

demonstrated in two areas; first, in the process of curricular design at newly formed schools, and, second, in the process of curricular modification at schools which changed to the three year format.

In response to the apparent physician shortage, 21 new medical schools were formed during the period from 1963 to 1972. (59) In 1972 Lippard and Purcell presented case histories of ten of the new schools, consisting of reports by the Medical Schools' Deans which detailed the process of the schools' formation. Curricular planning was discussed, including the roles given to electives and free time. Not surprisingly, most of the curricula fall into established patterns with identifiable sources. Of the six programs which were four years in length, all offered an elective fourth year and all used some amount of integrated teaching in the basic science period. The influences of Western Reserve and Duke are clear. Of the other four programs, two were limited to pre-clinical training, integrating this with the undergraduate college, one was a three year program with virtually no free time or electives, and one (unimplemented) intended to integrate both the clinical and elective years into postgraduate specialty training.

From these ten case histories, two relevant observations can be made. First, one can see that various people within the medical schools had widely different views about the proper role of electives. At the University of California at San Diego, the following debate over the role of electives occurred:

One group saw these as an opportunity for the hard-pressed student to relax from his arduous, narrowly confined medical studies and broaden his perspectives. Another regarded electives as the means for a joint Ph.D.-M.D. program. Still others hoped that judicious use of electives would shorten the path to full professional status. What emerged was a concept of an elective program or concentration

area tailored to each student and supervised by an expert faculty group. . . . In its original emphasis the concentration area was conceived as academic-broadening and individualizing the student's training and not intended to lead him prematurely into specialization. (60)

The idea of structuring electives around a defined concentration area such as Neuroscience or Growth and Development really amounts to institutionalization of what had been done at Duke on an individual basis, and this idea was widely adopted by schools during the 1970's. (61)

A second observation made in regard to these case studies is that with few exceptions, curricular planning seems to have been undertaken with little reference to the past or recent history of medical education. With surprising regularity, programs which were fairly typical of an era were presented as if they were entirely new. It seems that many of the people involved in the curricular planning process had very limited knowledge of educational programs other than the particular ones in which they had been trained.

Another response to the demand for more graduates was the development of three-year medical programs. The basic idea was simple: by eliminating most vacations and curtailing free time and elective periods, the required content of a conventional four-year program could be fitted into three years. The school could then increase its class size by one third, but since the total number of students would not change, the need for new facilities and faculty would be limited. A similar plan had been used during World War II with no apparent ill effect on the graduates. (62) The idea was endorsed by a Carnegie Commission Report in 1970 as a way of increasing the supply of graduates and as a way of cutting costs. (63) Later endorsed by various groups such as the student wing of the A.M.A., (64) the idea gained its real strength by the health

manpower legislation of 1971, which provided schools with \$2,000 of support above the standard per student amount for each three-year program student. (65) Thus a school with a total student body of 300 would gain \$600,000 per year simply by having 3 classes of 100 members instead of 4 classes of 75.

By the 1973-74 school year, the three-year program was an option at 59 conventional schools and by 1975 was the mandated program at 19 schools. (66) It is surprising that such programs would become so widely accepted just at a time when the need for a flexible and individualized education was beginning to be appreciated. Educators at the three-year schools cited the saved year as the main aspect of flexibility in their programs, for in theory this year could be used as the graduate saw fit. (67) However, it is hard to imagine a newly graduated M.D., with the means of earning a living and the opportunity to begin his long-awaited career, devoting a year to purely education pursuits. In addition, the basic idea is flawed for it maintains that a program's flexibility exists outside the program. A rigid program of any length could claim flexibility on these grounds.

During the late 1970's, the popularity of the three-year program fell as quickly as it had risen. By 1979, three-year schools accounted for only six percent of the total. (68) The irony is that these programs failed not because of conceptual flaws or diminished student performance. They failed because the subjective "quality of life" for students and faculty apparently deteriorated and because directors of residency training programs felt, in spite of evidence to the contrary, that three-year graduates were less desirable than their four-year counterparts. (69) Perhaps it is fitting that a movement whose goals

were based on untested assumptions, and whose means were flawed in concept, should succumb to criticism based on purely subjective preference and outright prejudice.

It is too early to tell whether the effort to produce more physicians will be regarded as a major advance in the nation's health care or as an expensive, misguided folly. Whatever the results, it seems clear that a preoccupation with the physician manpower issue temporarily diverted some medical educators' attention from more purely educational issues confronted in the 1950's and early 1960's, such as curricular flexibility and growing student involvement in educational decision making.

VI

Vernon Lippard, surveying the changing state of the medical curriculum in 1972, pointed out that interest in reform was then more widespread than at any time since the Flexner Report. (70) Unlike the reforms of 1910-1920, which had been initiated by an outsider and directed against institutions which were politically and financially weak, these new reforms were initiated by insiders, who were faced with trying to influence systems which were powerful, well-established, and often defensive. The new reformers saw that the traditional educational model had little ability to meet new demands, and they apparently realized the short term nature of changes encouraged by the government. Above all, the reformers shared a desire for flexibility in medical education. This flexibility would not only allow the system to meet a diversity of student and institutional needs, but it would equip the system with a means of adapting to the changing demands of the future.

Searching for the origins of this new awareness and this shared goal, two sources in the previous decade can be found. The first was the realization that medical education was an evolving process, and the second was the willingness to test the assumptions of medical education by scientific means.

The programs at Western Reserve and at Duke challenged respectively the assumptions that medical education needed to be comprehensive and that it needed to be uniform. Both were highly visible "experiments," probably due to the personalities and reputations of the individuals involved. The success of these programs made the point that medical education did not have a single, unchanging goal. Its goals were multiple, and they changed in response to the changing needs of society. The feeling among schools that their proper goal was to be like Johns Hopkins of 1910 disappeared in response to objective proof to the contrary. (71)

Following this realization, there appeared a wealth of articles and conference reports concerned with the role of medical education. In a fairly typical example of this genre from 1965, Cope and Zacharias define their version of this new role:

It must provide, somehow, generalists with a wide range of knowledge and skills; specialists with a profundity of insight and the capacity to manage increasingly intricate facilities; research men who can move medicine steadily forward toward new goals; medical men akin in function to systems engineers--all of them in numbers greater than ever before; and it must do all this in the face of an insatiable public demand for accomplishment. (72)

In 1968, Robert Ebert, the Dean of Harvard Medical School, listed four basic attributes of a proper medical curriculum. To paraphrase him: (73)

1. Medical schools should recognize students' individual aptitudes and abilities.

2. Every student should have time to pursue knowledge in one area of particular interest by research or directed study.
3. The student should be given significant responsibility for his own non-clinical education, and graded responsibility for patient care.
4. More than one curriculum should exist to accommodate different student interests and background.

It is striking that these basic principles, so sensible and so much in the tradition of university higher education, could have ever been absent from the medical curriculum. By their absence the conservatism and rigidity of the traditional system are clearly defined. By 1972, one medical school Dean used all the goals of the traditional system as examples of what a curriculum specifically could not do:

An adequate curriculum today cannot hope to transform a student into a totally competent physician ready to practice all branches of medicine; it cannot hope to inculcate all the knowledge of the basic sciences or the clinical fields; it cannot even pretend adequately to introduce the student to all the branches of medicine; it cannot provide for the the same student an education that has meaning simultaneously in medical sciences, clinical medicine, social and preventive medicine, medical history, and behavioral science. Nor is it possible to achieve that much talked of objective of the post war years--the undifferentiated physician. (74)

Never before had medical educators been willing to set such limits on themselves.

By accepting new and multiple roles, and by adopting very basic educational goals and specific limits, educators allowed the medical schools to resume an evolutionary process which had been arrested for forty years.

VII

With the acknowledgment of the idea that changes were inevitable, came the realization that reliable methods for measuring and evaluating

those changes were needed. The desire to investigate the process of medical education by scientific methods arose at Western Reserve and a few other schools in the late 1950's, and by 1970 about half of all of the schools had divisions of research in medical education. (75)

Although medicine had clearly accepted the principles of science, up until this time medical education was largely empirical in its ministrations to itself. During the 1960's and 1970's, decisions about the medical curriculum began to be made on the basis of scientific evidence.

However, this growing body of evidence had two weaknesses. Many medical educators, with extensive training in the "hard" sciences, viewed the social sciences, including educational research, as "soft." Also, many of the studies undertaken were concerned with very minor issues. Just as the educators of the 1920's and 1930's had gotten bogged down in rearranging schedules and juggling hours between subjects, these scientific educators became overly concerned with the relative merits of lectures, videotapes, programmed texts, and the like in teaching the various subjects, but in spite of this preoccupation with the means of instruction, several valuable contributions were made.

First of all, general knowledge of learning psychology began to be assimilated by medical schools. George Miller, a professional educator, speaking at a 1967 A.A.M.C. seminar summarized several points upon which most learning psychologists agreed. Two of these are particularly relevant to the issues of elective courses and free time:

First, there is general agreement that learning is an individual matter, something done by the learner and not achieved by magical transmission from the teacher. If learning is indeed individual, and we accept the basic biological principle of individual differences, then it is clear that educational programs must provide an opportunity for different individuals to move at different speeds, by different

patterns, using different methods. It is unlikely that a single program or a single form of instruction will be optimal for all.

Second, all learning psychologists are agreed that motivation is essential to the learning task. . . . Is it likely that students coerced into learning will become "students for life" in the sense we have been discussing here? No, the most important kind of motivation to encourage is that which is intrinsic and whose fulfillment leads to the satisfaction of having learned something that is important and relevant to the individual student's life goal, not important and relevant to the goal of the teacher alone. (76)

Clearly, significant amounts of free time and elective opportunities could allow students to work in their individual ways, motivated by their own particular needs.

A second contribution of the scientific study of the medical education was the challenging of several widely and firmly held beliefs. The interest in schedules and curricular hours, for example, which characterized so much of twentieth century American medical education, was rooted in the belief that the amount of time spent studying a subject must determine how much is learned. In 1967 this assumption was tested, and the results show that scores achieved by a student on standardized tests of the basic science and clinical subjects did not correlate with the time devoted to these subjects by the student's particular school. (77)

In contrast, a positive relationship was found between these test scores and the test scores achieved on the standardized medical school admission test. Two conclusions can be drawn. First, that curricular exposure is not related to retained factual knowledge, and second, that people who do well on one standardized test tend to do well on another.

Another widely held belief was that a student's experience in medical school was an important factor in the choice of his particular

career. Faculty had long assumed that they, as role models, influenced their students' career choices. This, too, was brought into question.

Daniel Funkenstein, studying the period from 1958-1976, concluded that:

Factors outside of the medical school, such as economic incentives and ideology, are the leading factors in the career choices of medical students. (78)

Funkenstein's study suggests that career choices were not affected by curricula or teachers, but by certain qualities of the applicants admitted to medical school and by their perception of certain economic and social needs. Thus, changing a curriculum in one way or another does not necessarily influence the career choices of the affected students.

A third assumption, more basic than the previous two, was also questioned. In the studies of Osler Peterson in the late 1950's, and in the more recent studies of Price and Taylor, no relationship could be found between a student's performance in medical school and his later performance in medical practice. (79,80)

The results obtained in these three, and other, areas of study made medical educators realize that many of the traditional accomplishments of medical school could not be attributed to the traditional system. This realization, and the acceptance of some well established principles of learning theory, allowed medical educators to experiment freely with the curriculum with little fear of doing harm either to the students' education or to future patients' health, and with the strong hope of producing self motivated physicians, capable of life-long self-education.

VIII

In the 1970's, many aspects of the medical education system became more flexible. Some of these changes, such as new admission policies encouraging more women and minority applicants, are outside the scope of this investigation. However, the most visible changes are in the curriculum, especially in the appearance of increased opportunities for student initiative and free choice.

Reporting to a 1972 conference studying changes in the medical curriculum, Vernon Lippard noted:

The most extensive and widely adopted change has been in the introduction of the elective programs. Even schools that have for decades scheduled almost every minute over the four years in required courses, each followed by an examination, now provide some opportunity for the pursuit of special interest. Although some schedules allow time for electives throughout the four years, there is a great tendency to concentrate the required courses or core curriculum in the first two-and-one-half to three years. At almost all schools the fourth year is elective. The extent to which elective programs are controlled varies widely from complete freedom of choice to those that are quite standard. (81)

These programs are usually determined by the student with help and approval of an advisor or a specific committee, and often the program is devoted to a broad theme or "track," usually based on either a career choice (psychiatry, surgery, etc.) or a scientific subject area (neuroscience, growth and development, etc.). (82) Descriptions exist of many such elective programs, designed to serve a variety of goals.

At Harvard, integrated basic science teaching and an elective fourth year were introduced to "cultivate habits of independent thinking and scholarship that will assure continuing assimilation of new knowledge after graduation." (83) The University of California at San Diego, a new school, built a program from scratch around the concept of a

"concentration area." Free time was given in increasing amounts during the four years, from 1 day per week in the first year, and 2 days per week in the second, to over 50% of the time in the final two years. (84) This time would be used by the student first to develop individual interests, and then to tie together his interests and career goals in a unique sequence of courses or projects. Students were encouraged to have contact with a wide range of faculty so that all students would be aware of opportunities which had formerly been open only to the most aggressive. (85) A program at University of California at Los Angeles saw an elective fourth year as a way of serving several goals. It could be an opportunity for study in depth, it could be remedial for a student with certain weaknesses, and it could involve medical students with institutions outside of teaching hospital, such as community hospitals and clinics. (86)

In addition to increased free time and electives, free choice was introduced into other parts of the curriculum. Independent study programs in the basic sciences were introduced. At Ohio State for example, students were allowed a choice of self-study methods for meeting a basic science requirement. (87) The University of Illinois introduced a program devoting all of medical school to an independent study program developed by the student under an advisor's guidance. Graduation requirements were minimal, including only passage of certifying exams, completion of an in depth study, and demonstration of clinical skills. (88)

Programs such as those offered new opportunities to both students and schools. How these opportunities were used was often disappointing, a result similar to that observed in the "graduate school plan" of the

1920's. It was observed that students tended to act only in their own short-term interests, with most using electives to serve purely vocational goals. Even at the medical schools of great universities such as Harvard, Stanford, Yale, and U.C.L.A., students used their elective opportunities not to exploit the unique and valuable resources of their institutions, but to prepare for their internships by taking the traditional clinical subspecialty rotations. (89,90,91,92)

Just as many students at the liberal schools of the 1920's had opted for an education as limited as that mandated by the conventional schools, many students of the 1970's used their extensive elective opportunities to take the required courses of a previous era. Two likely sources of the students' apparent conservatism can be suggested.

The first is that the medical school admission process does not choose students with sufficient experience in or capacity for self-education. Clearly the past emphasis on high grade-point averages by admission committees has caused applicants to take fewer and lower level science courses in order to assure higher average grades. (93) A second source, and one which the student faces directly, is the general conservatism of the medical profession. Although a student may spend four years in a medical school environment where the value of new ideas is appreciated, he sees himself spending the rest of his career in a setting where the traditional educational model is still accepted. Subtly or bluntly, the medical student is told by physicians in training or physicians in practice that the education he is receiving is somehow inferior to the older form. The student, having had to accept many other things from his mentors on faith alone, accepts this also.

The means for solving this second problem exists, but has yet to be used extensively. It has been pointed out that post-graduate training programs could exert pressure through the process by which they choose residents and interns making it known that:

. . . the development of a high degree of clinical expertise while still in medical school is not their perception of the best way for students to spend their time. (94)

The student's desire for the most competitive positions would cause him to use his free choice opportunities in a less prescribed manner. At the present time, however, there is not enough cooperation between undergraduate medical education, controlled largely by universities, and graduate medical education, controlled by the profession through the accreditation process, to allow this to happen.

Aside from a somewhat disappointing use of opportunities, the flexible programs have shown other weaknesses. Lippard pointed out that in poorly operated flexible programs the core curriculum could amount to "pedagogic malnutrition" and the elective component could become a "cafeteria experience." (95) He also pointed out the dangers of premature specialization and of too much purely practical clinical experience, often undertaken in poorly supervised settings. (96) Other common complaints are the difficulty of establishing adequate advisory systems and the increase in faculty work load. (97)

By the late 1970's, cost was "the most formidable obstacle to developing flexibility." (98) Faculty time and effort had to be devoted less to student advising and project work and more to activities capable of bringing money into the institution, such as attracting outside research funds and providing clinical services for payment.

Aside from the cost of the programs themselves, economic considerations pose other dangers to the curricular reforms of the early 1970's. The rising cost to the student of a medical education threatens to limit the diversity of applicants which had so recently been cultivated. New limitations on funding for research could eliminate some student research opportunities. The threat of an impending physician surplus could make students look at their medical school experiences primarily as opportunities to learn specific, marketable skills. Graduate medical education, looking to fill patient care needs with as little outlay and effort as possible, could encourage greater uniformity of applicants.

If students had been using elective opportunities somewhat conservatively already, then outside forces such as these could have the effect of creating a curricular rigidity as powerful as that created in the past by the schools themselves. The opportunities created by the reforms of the 1970's would be used less and less, and the advances made would soon be forgotten.

IX

Elective and free time have played a variety of roles in the undergraduate medical curriculum since the time of Flexner. Initially ignored, overshadowed by the reformers' overzealous concern with other aspects of the curriculum, electives and free time took on major importance in the progressive educational programs of the 1920's, such as Yale, and minor importance in the balance of the schools. With the growth of biomedical science in the period from 1930-1952, their share of curricular time was usurped by this new scientific information. During the late 1950's and 1960's, free time and elective opportunities

were seen as ways of adapting the traditional curriculum to new goals, at first those of the institution and later those of the individual student. Following a period of self-examination, and supported by data questioning the value of the traditional system, electives, free time, and free choice became significant parts of medical education in the 1970's.

Having seen the changing role of electives and free time in certain historical periods, another question is raised. What is the origin of the role they play at a particular time, in a particular program? To answer this, one must look at how specific programs created a theoretical role for these two features, and what role they played in actual practice.

FOUR CASE HISTORIES

The purpose of this section is to examine in more detail the role of electives and free time in four very different experiments in curricular reform. The schools chosen (Yale, Western Reserve, Duke, and Stanford) all instituted reforms in response to weaknesses manifested by the traditional system in different eras. Each of these programs gave electives and free time an important role in serving the underlying educational philosophy. In each case this philosophy has been publicly expressed, and the process of planning and instituting curricular reform has been described. In addition, each program has attempted some type of evaluation of the results achieved. As there exists no uniform method of assessing results of medical education, these evaluations are often largely subjective.

By reviewing this documentary information, and by relating it to the historical context described previously, the transformation of a program from a theory to an actuality can be examined. The forces defining the role of electives and free time in the particular case can then be identified.

The Yale System

The program at Yale, introduced in 1926, is a prime example of the "graduate school plan" of medical education. This type of plan originated in the 1920's, in response to the extreme rigidity of the medical curriculum which had emerged in the reform period immediately following the Flexner Report. The basic idea of this plan was to conduct medical education in the traditional spirit of graduate education, using the traditional means.

At Yale, this philosophy developed following a period of intense institutional reorganization. In 1910, the school was in a weak position, with poor facilities, an inadequate hospital, and little financial or moral support from Yale University. (99) A new Dean, George Blumer, was appointed in 1910 and the following decade, although a period of struggle, saw two accomplishments. First, the medical school became an integral part of Yale University and began to adopt university practices and standards. Second, new and dynamic faculty members, such as Milton Winternitz and Samuel Harvey were brought in.

Winternitz, an excellent scientist, and an aggressive and inventive leader, was appointed Dean in 1920, and his ambitious plans found a strong supporter with the appointment of James Angell as University President in 1922. By attracting the financial support of both individuals and foundations, new facilities were built and better faculty and students were attracted.

In the midst of this ferment, in 1926, a new educational program was introduced. Its main features can be summarized as follows: (100)

1. Elimination of standard schedules and time limits.
2. Elimination of required examinations and grades.
3. Increased responsibility of the student for his own education, demonstrated by an emphasis on elective courses and the requirement of an M.D. thesis as evidence of individual accomplishment.

The requirements for graduation were minimal, consisting of passage of pre-clinical and clinical comprehensive examinations, completion of 39 weeks of required clinical work, and submission of an acceptable thesis. (101)

The philosophy behind this curriculum was vague, but apparently this was deliberate. Lippard later pointed out that:

It should be recalled that it was the aim of the founders of this plan to create an atmosphere favorable for learning rather than a unique curriculum. They probably would have challenged anyone's ability to define its methods precisely. (102)

Winternitz was uncharacteristically reticent when faced with expounding on the educational philosophy. He took no credit for the basic idea, and he seemed to disdain the idea of trying to formalize the process.

Obviously there is nothing new in this plan. It is graduate education as this is known all over the world, even in the United States. (103)

Every effort must be made not to stifle the opportunities for learning by building up a great machine for teaching . . . In short, a university should protect learning against the inroads of teaching and methodology of all sorts. (104)

Winternitz felt that experimentation in the educational process and the resulting flux in the actual curriculum were sources of an institution's vitality. (105) Any means could be used to serve the basic objectives of encouraging the development of the student's intelligence and expanding his capacity for responsibility.

The strength of such a system lies in its flexibility. By adopting basic and broad goals, by using the time tested mechanisms of graduate education, and by being deliberately vague in its day-to-day details, any changes in emphasis or methodology can be accommodated without having to tear down elaborate institutional structures or build up new ones. This flexibility allowed the Yale system to persist after the other experiments of the 1920's had disappeared.

Electives and free time were important in this curriculum from the start. First of all, the time devoted to instruction in the basic sciences was cut approximately in half. (106) Secondly, students did not

have to attend this instruction if they thought they could pass the qualifying examination with other preparation. Thirdly, the curtailed clinical experiences allowed a potential of 33 consecutive weeks to be devoted to student-determined uses. (107) The thesis requirement has usually served to interest students in research projects. (108) In addition, the student was allowed and encouraged to take extra years of study, with all of this time devoted to the student's particular needs and interests. Thus, the resources of the university and the standards of the medical school were used less to provide a guarantee of minimal competence than to provide an opportunity for maximal accomplishment.

Over time, the philosophy of the Yale System has remained intact, but several modifications of its operation have been attempted, including one significant attempt to alter the form of the elective component.

By 1965 the time devoted to required clerkships had risen from the 39 weeks of the original plan to 60 weeks, and the block of time devoted to the thesis and electives had decreased from two semesters to one. (109) In response to the changes which were beginning to be made at other "top-drawer" schools in the mid-1960's, the Ad-Hoc Committee to Re-evaluate the Goals of Medical Education and Their Implementation at Yale was appointed in 1965. (110) Its final report was issued a year later and is a somewhat uninspiring and disappointing document. It consists of a general philosophical statement of the goals of medical education typical of the mid 1960's genre described previously. It mentions the value of early career differentiation and the possibility of its being served by an elective program. It goes on to summarize the Yale program and recommend a number of changes which serve two basic goals. First of all, the basic sciences and clinical clerkship hours are redistributed

between departments and slightly curtailed, providing elective semesters at the ends of the pre-clinical and clinical periods. The second recommendation concerns the structure of the student's elective time, recommending that if a student does not have a "well-formulated program of his own," then a complex of courses correlating a clinical area with the appropriate basic sciences material would be required. (111) Examples of hypothetical interdisciplinary elective courses, such as "The Hemostatic Mechanisms in Disease," were given.

As a whole, the report is strikingly unimpressive. Its philosophy is not the least bit original. Its tone suggests that changes were to be made at Yale not for their intrinsic value but in response to changes at other schools and the fear that top Yale applicants might go elsewhere. In addition, the report expresses no real appreciation of the educational freedom and flexibility inherent in the Yale System in its original form. The schedule adjustments seem minor in retrospect and the idea of interdisciplinary "theme" elective courses is neither new nor especially compelling. No mechanism for the formation or sustenance of these courses is outlined. If they did not exist prior to this report, what would make them appear after it? Worst of all, the tone of this report reflects little confidence in the student's ability to make intelligent choices about his elective program or any of his education. There is a wide philosophical gulf between Winternitz's original concept of the Yale System, where student initiative combined with faculty responsiveness to stimulate learning, and this report's viewpoint, where the student is seen as a passive consumer of education, who likely requires a predetermined product to fill his two elective semesters.

The structuring of elective time progressed still further in the early 1970's with the introduction of a "multiple tract" program. The idea here was that in five broad, integrated subject areas (growth and development, behavioral science, biology of disease, community medicine, and physical science as applied to medicine) faculty from clinical and basic science departments would cooperatively design a series of programs and activities appropriate for study. (112) Students would follow this program or, with the approval of an advisor, deviate from it. In theory, the tracks were not career oriented, for all would tend to cover much basic pre-clinical and clinical material. The schedule was rearranged and the required clerkships decreased so that the three final semesters were available for this program.

Conceptually, this program is quite similar to several others of the late 1960's and early 1970's, notably those at Duke, Stanford, and San Diego. As in these programs, student response was somewhat disappointing. The students, most planning to enter clinical residency training programs, were anxious to obtain further clinical experience and knowledge, and did so at the expense of advanced basic science offerings.

The program proved frustrating to faculty and was unpopular with students. (113) In the political climate of the late 1970's, increases in educational structure were resented in principle by many students. In addition, although the tracks were not intended to be career oriented, students felt forced into career decisions one and one-half years prior to graduation. Finally, faculty in the clinical and basic science areas, holding often divergent views regarding educational content and method, were unable to sustain cooperative teaching efforts. As a result, the

multiple track program was terminated in the late 1970's and replaced by a system in which the student, with the approval of a faculty advisor, chooses or creates electives to fill his elective final year.

This most recent program, although difficult to keep track of and virtually impossible to evaluate, does embrace many of the original values of the Yale system. The burden of having a worthwhile elective experience is on the student. A somewhat uninspired result is probably not harmful in itself and does at least provide valuable experience in decision making. If a student makes especially good use of the elective opportunities then the credit is all his. The important thing is that independence and initiative are encouraged. The student with these qualities already well developed is given the chance to apply them to a wide range of university and medical center resources, and the student in whom these qualities are less well formed is given a prime opportunity for their development. Of course, this process is nothing new; it is higher education as traditionally practiced in non-professional institutions.

So, the Yale system and the elective component within it exist basically intact after almost sixty years. What results have been achieved by this unique educational approach? Winternitz found that most students tried to arrange a course of study in the conventional manner, and that "considerable effort is essential to succeed in having the minority scramble their curricula." (114) However, he also noted immediate improvement of the students' attitude toward their work and their instructors. (115) He later observed that although in elective opportunities, average students got less attention from faculty than did the few

brilliant students, the new graduates generally expressed great loyalty to the system. (116)

Lippard, reviewing the results of the system after over thirty years, found that Yale had an uncommonly high number of its graduates board certified in specialties and that only two schools had more graduates employed in full-time academic medicine. Looking at the performance of students during his term as Dean, Lippard noted that the average score of Yale students on the National Board of Medical Examiners examinations was "invariably at or near, the top of the list." (117) Given the emphasis on scientific research explicit in the thesis requirement and implicit in the multiple non-clinical elective opportunities, the large number of students in academic and specialty medicine would suggest that this type of curriculum was especially effective in preparing physicians for these careers. However, no data has been collected which would indicate the effects of the Yale curriculum on other aspects of medical practice.

It is unfortunate that no means of continuing self-study was established along with the new system. Due to lack of data, the apparently favorable outcome of this experiment cannot be attributed with any certainty to either the underlying educational philosophy or to the curricular devices employed. However, few other schools have been able to develop an educational philosophy that has survived intact for almost sixty years.

The Western Reserve Program

The educational program introduced at Western Reserve University in 1952 marked a rebirth of interest in the process of medical education.

The complacency and rigidity of the traditional system were challenged on almost every front.

A new educational model, based on the idea that comprehensiveness was impossible, adopted new attitudes towards learning and employed new methods of teaching. Today, when the notion of a comprehensive medical education seems clearly absurd, the Western Reserve program is best remembered for its innovative teaching methods. The employment of integrated teaching in the basic sciences, the use of multidisciplinary student laboratories, and the early exposure of the student to patients, all have been widely accepted, but all were considered heretical in the early 1950's. Greer Williams has made a comprehensive study of the personal and institutional dynamics behind this fascinating experiment, so the emphasis here will be on the actual curriculum.

Robert Ebert, Dean at Harvard, and formerly a faculty member at Western Reserve, retrospectively identified the basic assumptions of this experiment: (118)

1. It is impossible for the student to learn everything, and the selection of what to learn is the faculty's responsibility.
2. The curriculum should be a logical continuum designed cooperatively by all of the faculty.
3. Interdisciplinary teaching should be used to discourage artificially compartmentalized thinking.
4. The clinical and pre-clinical curriculum should be mixed.
5. The curriculum should produce an "undifferentiated" physician.

The first four of these were in clear opposition to the standard system. The last, the idea of the "blast cell physician," was a common notion in the period, and really represents medical education's concession to the concept of specialty medicine. (119)

T. Hale Ham, one of the leaders in the experiment, attempted to define what the school should do from a student's viewpoint. He concluded that the school must care about the student, designate to the student what is important, guide the student, and indicate to him how he is doing. (120) Prior to this time schools had generally adopted an impersonal role. They were much more concerned with setting standards and testing the student's performance than with understanding how the student was faring as a person. The idea at Western Reserve was to create a system which would fulfill its responsibility of producing competent physicians without ignoring its responsibility to treat students as human beings. Medical education was viewed as an opportunity to develop intellect and character in the service of a certain goal, not as a course of intellectual and emotional hurdles to be overcome.

A dramatic, symbolic expression of this idea was the decision to start the student's medical career with exposure to patients rather than cadavers. By delaying Gross Anatomy, and by initiating patient contact on the first day, the school clearly rejected the attitudes of the past. Douglas Bond, one of the founders, deplored these old attitudes:

. . . we have treated the basic sciences as if they were spinach which you had to eat before you got the dessert of clinical medicine. This is ridiculous . . . The (students) are not children and they're not eating a meal. (121)

A curriculum was devised which would encourage the development of intellect and character simultaneously. Factual information was presented in three phases. Phase I, an integrated course in human biology, was followed by Phase II, an integrated course in disease. Concomitantly, the personal development of the student was fostered by increasing amounts of patient contact and an examination of the physician-patient

relationship in a behavioral science context. Phase III, structured around an integrated clinical clerkship, allowed the student to combine his developing intellect and attitudes in the service of patients.

In its original form, the curriculum gave an important role to free time. During Phases I and II, of a scheduled $5\frac{1}{2}$ day, 44 hour week, one and one-half days were free, to be used as the student saw fit. (122) Of the 68 weeks of Phase III, 32 were free or elective. Use of this time was to be determined by the student and an advisor. It could include research, electives, or anything else acceptable to both.

The new curriculum was basically successful in its original form. However, due to logistical problems and institutional politics some of its most innovative features were either scrapped or redesigned in a more traditional mold. Clinical departments proved unable to cooperate, and the integrated clerkship was replaced by traditional departmental clerkships. Likewise, free time was quickly reduced.

The free time in Phases I and II was consistently confused by the faculty with required elective time. (123) A required basic science research project, which had its own time allotment, also began to intrude. (124) The original 32 weeks of free time in Phase III shrank to 8 weeks by 1964, due to demands by the clinical departments for more required clerkships and required clinical electives. (125) By 1968 elective time and the remaining free time were used as "a disposal area for various sins of omission." (126) Anything lacking a specific place in the curriculum was assumed to be covered in an elective.

The role of free time and electives withered because although they had been seen as valuable features, they were not supported by any specific aspect of the basic educational philosophy. Western Reserve

improved on the standard, prescribed curriculum, but it did so by adopting new prescriptions, and by administering them in a more palatable preparation. By not accepting the idea that the student was responsible for his own education, the institution never endorsed fully the value of electives and free time. Ebert points out that while students at Western Reserve experienced better teaching, and had a more enjoyable education, they were probably no better as scientists or humanists than graduates of any other system. (127) Although Western Reserve did have a division of research in medical education which attempted to evaluate the program, the existence of almost continuous changes in curriculum makes it difficult to interpret the data.

The new curriculum clearly was attractive to applicants. By 1957, students who were accepted both by Western Reserve and by the "best" schools preferred the former by a three to one ratio and the applicants' average admission test scores increased. (128) By the mid-1970's, these effects were lost. In terms of graduate career choices, no changes could be found referable to the curriculum. (129)

These results are not surprising. The reforms at Western Reserve made medical education more enjoyable, which was an attraction to any applicant. The treatment of students was humane, the curriculum was sensible, but the educational experience offered at Western Reserve was probably no more challenging than that at other schools. With the rapid erosion of the free-choice aspects of the original reform curriculum, the student's opportunity to take significant responsibility for his own education disappeared. Clearly, if a program of electives and free time is to have value, it is necessary for the institution to express belief

in the underlying ideals. Western Reserve failed to do this, and what could have been an important part of its educational legacy was lost.

The Elective Curriculum at Duke

The curriculum introduced at Duke in 1966 took the unheard-of step of placing two full years of undergraduate medical education under the control of the student. The required material of four years was edited to fit into two, allowing the student to use (under faculty guidance) the medical school and university resources for his own benefit for the two final years. This radical revision arose out of an effort initiated in the late 1950's to produce more medical scientists.

In 1950 Duke, like other schools, had a very rigid curriculum. Over 97% of the total hours were devoted to required subjects. (130) As medical research grew at Duke in the 1950's, the new research-oriented faculty found that they could not prepare students for careers in medical science in such an inflexible system. The Research Training Program, initiated in 1957 with support of several prominent medical scientists, demonstrated that highly motivated students could devote a considerable portion of their medical school career to research and not be deficient in other areas. It was realized that students with other career goals could benefit from a similarly individualized experience. At the same time, medical schools began to admit that they couldn't hope to teach everything, and that at best they could equip the student with a core of biomedical knowledge, expose him to clinical problem solving, and convince him of his responsibility for continuing self-education. (131)

At Duke it was realized that as medical schools' aims became more limited, and as students' career opportunities expanded, it made sense to

devote more of the period of medical education to the students' individual interests. The appointments of a new Dean and eight new department chairman between 1960 and 1966 eliminated much potential resistance to curricular change, and with the financial support of several foundations, a new system was developed.

The curriculum that emerged from the planning process was put into effect in 1966 and listed the following aims:

1. to provide a strong academic basis for a lifetime of growth within the profession of medicine, with the development of technical competency, proficiency, and the proper attitude peculiar to the practice of medicine as well as appreciation of the broader social and service responsibilities;
2. to establish in the first year a basic science program which will fulfill the purposes of the increasingly heterogeneous student body;
3. to offer both clinical and basic science education simultaneously;
4. to permit the student to explore his personal intellectual preferences and capabilities;
5. to allow study in depth in selected areas, either basic science or clinical;
6. to provide greater freedom of course selection, and thus to encourage earlier career decision;
7. to achieve better integration of the medical school curriculum with residency training and the practice of medicine. (132)

These aims were to be achieved by an intense, one year exposure to the basic sciences, a second year devoted to required clerkships, and by a final two year period devoted to the student's particular interests. The first of the individualized years would be devoted to advanced basic science courses or research, and the second to appropriate clinical electives. The student would plan these two years with the help of several individual and departmental advisors, and the proposed program

would require the approval of an administrative committee. In theory, half of the student's education was purely elective. How was this elective time used in practice?

Not surprisingly, there was less interest in basic science than in clinical electives, and of the basic science offerings, those which emphasized clinical correlations were the most favored. (133) During the third year students favored electives in Pathology, Microbiology-Immunology, and Physiology-Pharmacology. In the fourth year Medicine, Surgery, and Pediatrics were the most popular. These results are about what one would predict, knowing that most Duke graduates traditionally entered specialty medicine.

In terms of evaluation, many interesting observations have been made. During the second year of the elective curriculum, when second year students were doing their clinical clerkships alongside the third year students of the old curriculum, there was no apparent difference in clerkship performance between those who had one year and those who had two years of basic science. (134) This perception was supported by the fact that student scores on the basic science section (Part I) of the National Board Examination did not decrease after the required basic science exposure was cut from two years to one. (135) Likewise, student scores on Parts II and III were unchanged after the introduction of the elective curriculum. (136) Based on these admittedly limited standards, the new curriculum was certainly not inferior to the old one, and of course it did permit two elective years.

The program was clearly attractive to applicants. Duke's reputation changed from one of regional excellence to one of national

prominence. The school's ability to attract applicants with multiple acceptance significantly increased following the plan's introduction. (137)

Retrospectively, students were enthusiastic about their experiences at Duke. They pointed out that after the first two years, the student had an overview of all of basic medical science and clinical medicine, and that this broad data base allowed each student to identify his individual strengths, weaknesses, and interests. (138) Students liked not having to wait two years before having clinical responsibilities, and they appreciated the fact that the elective years were relatively free of frustrating impediments and restrictions. (139)

To students, the attractiveness of the Duke program lies in the fact that it fits very well with the natural ebb and flow of student interest, and that it contains the means of relieving common student anxieties. The "bitter pill" of basic science is a small one, and the student is quickly introduced to clinical medicine. In that setting, he soon realizes the need for more scientific medical knowledge and he is immediately given the opportunity to gain it. This "second chance" in the basic sciences allows students to eliminate weaknesses and build on strengths. Likewise, the advanced clinical opportunities of the fourth year serve to allay anxiety about possible clinical incompetence in the impending internship. So, on the basis of limited objective standards such as National Board performance the elective system is adequate, and if on the basis of student favor it seems to excell, then where are its weaknesses?

During the program's design, Joseph Wearn, Dean and leader of the reforms at Western Reserve, questioned two aspects of the program in a

report to one of the supporting foundations. He pointed out that the plan lacked any specific broad training for general practitioners, and he wondered whether early career decisions were really desirable. (140) The planners at Duke responded by saying that Duke had traditionally produced specialists, that the process of career choice was not understood, and the elective freedom could be applied to generalization rather than specialization. (141)

Cost as well could be a weakness. During the period immediately following the introduction of the new plan, faculty work load increased, as did the cost of educating a student. (142) However, this is hard to attribute specifically to the curriculum as the period was one of rapid institutional growth.

On a philosophical plane, two major unanswered questions appear. First of all, did the institution really believe in the idea of two years of elective work? If so, why did increasing numbers of students graduate early during the period of the first six graduating classes. By 1975, 67% of the students graduated in less than four years. How can an institution maintain that this elective time is valuable if it allows two-thirds of the students to eliminate part of it?

Secondly, does this curriculum really foster the student's acquisition of the scientific method? Students trained in the elective curriculum were asked in a survey to rate the importance of several personal attributes of physicians. They did not regard "ability to participate in research" as being of major importance compared with manual dexterity, the ability to memorize, natural science knowledge, social science knowledge, affability, or decisiveness. (143) Maybe the Duke curriculum encourages the acquisition of scientific and technical knowledge

appropriate to a certain specialty career at the expense of a broad appreciation of the scientific method. If this is the case, then the elective years are serving a largely vocational function.

The attractiveness and adaptability of the Duke model caused it to be widely imitated, with varying lengths of time devoted to the basic science core and to the elective component. There is a possible danger in this imitation, especially at schools which have a minimal research orientation. It is possible that a curtailed basic science experience, stripped of laboratory experience and largely didactic in method, could fail to teach adequately the scientific method. If students at Duke, with presumably strong pre-medical science backgrounds, and immersed in a sea of research activities, could fail to value scientific ability highly, then students less exposed to actual experience in the scientific method could fail to appreciate it altogether.

Clearly such curricula give students expanded opportunities, but whether they have properly prepared the student to use these opportunities is open to question.

The Stanford Elective Curriculum

When Stanford moved its medical school from San Francisco to Palo Alto in 1959, a new 5-year curriculum was introduced. The plan provided for three pre-clinical years during which half of the student's time would be devoted to basic science courses, and half devoted to electives or research in any part of the university. This was followed by two conventional clinical years.

By the mid-1960's, the need for further changes became apparent. The incoming students were better prepared in the biological sciences

and the financial burden of the extra year began to be criticized. Students complained that an increasing volume of the supposedly limited basic science core material was limiting their elective opportunities. The faculty was tiring of constantly redefining and re-editing the core material. (144)

In 1967 the Dean appointed a committee to study these problems, and it came up with a simple, two-part definition of the curriculum's proper role. It should require each student to acquire certain knowledge and experience essential to medical practice but it should allow the student the freedom to choose the means of this learning. In addition, the curriculum should incorporate mechanisms for continuous change in response to changing faculty and student needs and interests. (145)

These goals are virtually identical to those of the "graduate school plan" schools of the 1920's, and not surprisingly, the curricular design adopted is similar. However, certain new conditions were added. It was decided that all students should be trained to practice as physicians no matter what their career emphasis, that students should gain a wide exposure to the basic and clinical sciences early in medical school to crystalize career interests, and that the basic and clinical sciences should be less separated in time. (146) To serve the basic goals and satisfy these conditions, four broad requirements for graduation were set. To paraphrase these: (147)

1. The student must register for 11 academic quarters (33 months).
2. 192 academic credits must be completed. 64 of these must be in clinical work, and of these, 48 credits must be in clinical clerkships involving direct patient care under the supervision of Stanford faculty.
3. The student must pass all tests and subtests of Parts I and II of the National Board Examinations.

4. The student must demonstrate "suitability" for the practice of medicine.

These minimal requirements certainly allowed students a great deal of free choice, but they also created a need for greater faculty involvement with teaching. If students chose to learn the material needed to pass the exams by means other than the usual courses, then there must exist enough appropriate elective offerings to allow students to earn the required credits. Faculty must be willing to teach new and special courses as well as the traditional ones. In order to evaluate student performance and to determine "suitability," there must be ample student-faculty contact, and to help the student plan his time, an adequate advisory system must exist. All of these changes are virtually impossible for an administration to mandate, so the success of the program would depend largely on the willingness of the faculty to interact with students. There is evidence that many of these necessary opportunities for increased contact did not materialize.

The number of courses offered clearly was enlarged. Basic science offerings increased by over 10% and clinical electives increased by greater than 100%. (148) About 25% of the students took at least one course outside the medical school, and 15% took more than three, the most popular outside departments being music, languages and anthropology. Approximately one-fourth of students had papers published while at Stanford. (149)

While new opportunities clearly existed, most students also took all of the traditional medical school courses. On the average, each of the usual required courses attracted over 90% of the students. (150) Although students filled much of their time with these courses, many

opted to take an extra year, which presumably was to be used in a more individual way. During the three year period ending in 1975, about half of the students stayed in school for five years. (151)

Quantitative evaluation of the new program by means of National Board scores was attempted. As might be guessed, the last three classes in the old system and the first three classes in the new system scored equivalently on Parts I, II, and III. So in terms of these limited objective standards, the new curriculum did as well as the old. Interestingly, the minority of students with extremely non-standard programs "performed exceedingly well" on these exams. (152)

Qualitatively, the school's administrators noted several advantages of the program. (153,154) It could accommodate students with different backgrounds, different goals, and different styles of learning without requiring overly elaborate administrative mechanisms. The program allowed the student to self-educate if he desired, and it made the student take responsibility for deciding the form of his education. Even if he chose a very conventional program, at least the student had to make the choice. As commonly seems to be the case, the new curriculum proved an effective tool for recruiting top students. (155) Finally, the program assured continuing change.

Likewise, several questions about the curriculum were raised. (156) Six basic concerns, noted by the Associate Dean, John Steward are paraphrased as follows: (157)

1. An adequate advisory system is difficult to establish. The faculty advisors first used were found to be relatively uninformed, and a system of associate Deans was substituted.
2. Does a school meet its obligations to society if a graduate has no formal experience in a common clinical area, or does this only mean that the point at which a physician assumes

responsibility for the limits of his competence is moved into medical school?

3. Does a curriculum which requires no specific laboratory experience result in deficient student knowledge of the scientific method?
4. Is the elective curriculum too costly in terms of faculty time and other resources?
5. Scheduling is very difficult with many courses and many individual schedules.
6. Do financial pressures force the student to shorten his education and thereby lose many of the opportunities provided by the curriculum?

Aside from the administrative problems of scheduling and the issues of rising individual and institutional educational costs, these several concerns represent one basic question, one which has faced all schools which have given significant responsibility of free choice to the students. Can a school, through its faculty, have enough interest in and contact with its students to assess them as individuals and provide them with suitable guidance and opportunity, or must it concern itself primarily with assuring the universal attainment of arbitrary minimum standards? The progressive schools of the 1920's and the schools with extensive elective opportunities in the 1960's and 1970's have begged the question, and assumed that they must perform both tasks. What remains to be seen is whether this assumption amounts to use of "belt and suspenders" or whether it betrays an institution's lack of belief in its own ability to cooperate with a responsible student in the attainment of an appropriate medical education.

CONCLUSION

Having traced the changing role of electives in the medical curriculum over the past seventy years, and having examined their roles in several particular schools, what conclusions can be drawn about their proper use, and can these conclusions be applied to some of the current problems facing medical education? To answer these two basic questions it is first necessary to make several observations about the process of medical education in general.

Anyone taking a critical look at some aspect of American medical education is struck by the incoherence of the whole system. It is often impossible to find reasonable connections between social needs, institutional philosophies and actual educational practices. Carleton B. Chapman characterized this lack of appreciable order as follows:

Actually, the whole of medical education is a lavish, somewhat counterproductive, uncontrolled experiment. We don't really know what we've been doing. (158)

However, this lack of understanding is hardly surprising given the ways in which medical educators approach their tasks. In reading accounts of curricular planning one realizes that the planners have little knowledge of or interest in either the history of medical education or the scientific investigation of the educational process. The lessons learned in curricular revision of the distant or recent past are not appreciated because they are not sought. Likewise, scientific evaluation of educational results is often not attempted as part of a program of reform, limiting the future interpretation of the value of such reforms. The process of medical education is poorly understood not because it is

so complex but because it has been so poorly studied. Alan Gregg pointed out in 1956 that:

Nothing would prove more valuable to the future of Great Medicine than learning steadily more of what happens in medical education. (159)

Although there have been many attempts to study the process, such as those cited in this paper, the volume and quality of this literature are disappointing, and there exists no basic body of scientific information which could be used by curricular planners. Thus, both historical reference and scientific evidence have had minimal influence on the decision making process in medical education.

A second general observation concerning undergraduate medical education is that the inherent limits of the educational system do not seem to be appreciated by the system itself or by its critics. Undergraduate medical education can take only a small part of the responsibility for the successes and failures of American medicine. Robert Ebert, former Dean of the Harvard Medical School, has expressed the idea that:

It is remarkably naive to think that four years of medical school will somehow be the dominant factor in shaping the lives of young men and women who enter medical school after sixteen years of educational experience and will continue their formal education for at least three to four years after graduation. (160)

As medical schools can control only three to four years of the much longer education of the medical professional, they cannot be expected to do more than a few things well. If the student can become versed in the scientific method in the context of the basic medical sciences, learn to apply medical science to clinical medicine in the clerkships, and learn self-education and self-motivation during the elective period, then that portion of his education will have been well spent. Although medical

schools are a convenient conduit for policies directed at medicine at large, they cannot be expected to do everything from instilling character to administering social justice.

Likewise, within the whole of undergraduate medical education, electives must be regarded with a sense of the limits of their role. The zeal for elaborate elective programs in the reforms of the 1970's seemed to create the attitude that the presence of liberal elective opportunities was itself a general sign of educational excellence. Electives cannot by themselves improve the quality of a weak school, encourage honesty or compassion, assure the student's grasp of the scientific method, or guarantee clinical competence. Accepting such limitations, a proper role for electives can be defined, based on a summary of the historical evidence presented previously.

The "graduate school plan" schools of the 1920's, the elective curriculum at Duke, and various programs of the 1970's saw electives as a way of individualizing the medical school experience and as a way of giving the student some significant responsibility for his own education. These two general goals of elective programs, individualization of content and development of intellectual independence are certainly noble goals in the broadest educational sense, but they have not been attained with any great regularity. As has been shown, students' educations in these programs have become less uniform, but only rarely does a student undertake an elective program which takes full advantage of the extensive resources of the university and the medical school. When given the opportunity to design their own programs, students generally pick a very traditional model. In effect, students choose to not have to exercise very much free choice. Giving students the opportunity to take

responsibility for their own education does not guarantee that any large number will do it. So, if the goal of such elective programs has been to require every student to take significant educational responsibilities, then none have met this goal. If the goal has been to provide many opportunities for a venturesome few, and a few opportunities for the masses then these programs have succeeded. However, this second easily attainable goal is simply too limited. The capacity to self-educate is as vital to a physician as is an understanding of medical science or the possession of basic clinical skills. Of the entire period of medical education, only the elective portion of the undergraduate years is devoted to the development and refinement of self-educational abilities, and this vital component of medical education should not be ignored. Yet, in the cases studied, there is little evidence of interest in evaluating elective programs with regard to the accomplishment of this basic goal. Evaluation of other parts of the medical curriculum has proved difficult, but at least it has been attempted, and elective programs deserve no less.

Looking again to the historical evidence, clear misuses of elective programs can be identified. At worst they have been used as ways of recruiting desirable students, as early preparation for and entrance into prestigious specialties, or as purely vocational clinical training. By not demanding more proper use of the elective period by applicants to residency training programs, Graduate Medical Education has sanctioned this vocational use, for it is clearly in the interest of the training program, and in the short-term interest of the applicant, for the elective period to be devoted to the acquisition of advanced clinical skills. Similarly, medical schools as a whole seem to take the value of

electives somewhat lightly. It has been noted that at Duke, where a strong devotion to the idea of electives has been claimed, almost two-thirds of the students were allowed to graduate early, cutting short this experience. During the brief popularity of the three-year format, the elective period was seen by the schools involved as being entirely expendable. If medical educators do not clearly express their belief in the value of electives, one can hardly expect these opportunities to be well used.

Based on the historical data, a set of limitations concerning the proper role of electives can be formulated. In terms of goals, there clearly are some that elective programs should not be asked to serve. These opportunities should not be expected to correct basic institutional weaknesses, they should not duplicate the experiences of internship or residency, they should not serve merely as advertisements or recruiting tools, and they should not be wasted. Limitations of means exist also. An elective program cannot be expected to succeed if it does not fit with student interest or if it does not recognize the unique organizational identity of the particular institution. A "multiple-track" elective program employed at Yale in the 1970's was unsuccessful not because it had incorrect goals but because it did not take into account the fact that students in that particular era resented the idea of increased educational structure, because it required a career choice at a point earlier than students were willing to accept, and because it failed to recognize the fundamental differences in educational methods and goals between basic scientists and clinicians. (161)

Accepting as the dual goals of an elective program the individualization of medical school content and the acquisition of the capacity for

responsible self-education, and accepting the fact that particular institutional limits may exist, a list of the conditions required for a successful elective system can be proposed. First of all, the non-elective portion of medical education must be adequate. Students will not undertake advanced work in the medical sciences if their basic science preparation is inadequate, and if their clinical clerkships are weak, their anxiety over whether they possess the clinical skills necessary for successful performance in the internship will cause their use of elective opportunities to be largely vocational.

Secondly, the capacity for self-education should be sought in medical school applicants. Students who have in their pasts taken a largely passive role in education cannot be expected to be adept at self-motivation during the elective period or during their later careers. Admission policies which stress performance on multiple-choice admission tests and grades achieved in college science courses (also often based on multiple-choice tests) should be modified to include a thorough search for evidence of a candidate's initiative and self-educational potential.

Thirdly, there must exist a faculty interested in teaching in the variety of ways required by elective programs. Although undergraduate medical education is a small part of faculty responsibility at a modern academic medical center, competing with graduate education in the basic sciences, graduate medical education, academic medical practice, biomedical research, and allied health professions education, its importance should not be forgotten. After all, medical schools were founded to educate medical students. For most medical students, the undergraduate medical school years are the last exposure to the educational standards

of the university. If faculty do not have enough time or interest to be involved with medical students then elective programs will surely fail. The basic science core curriculum and the clinical clerkships require much less widespread faculty effort, so their educational quality is a lagging indicator of the dedication of the faculty. Daniel Coit Gilman, first president of Johns Hopkins, pointed out that:

It is the faculty more than on any other body that the building of a university depends. They give their lives to the work. It is not the site, nor the apparatus, nor the halls, nor the library, nor the board of regents, which draws the scholars; it is a body of living teachers, skilled in their specialties, eminent in their calling, loving to teach. Such a body of teachers will make a university anywhere. (162)

Although Ebert has pointed out that basic differences exist between the faculties of universities and academic medical centers, (163) it does not seem unreasonable to require a medical faculty to meet basic university standards in teaching and research, including availability to students.

In terms of making an elective program work, faculty serve another important function. After studying many elective systems, L. Thompson Bowles has made the assessment that:

. . . the crux of a meaningful elective program is the presence of an informed, interested faculty who are willing to spend time advising students. (164)

Virtually all of the elective programs reviewed in this paper cited the difficulty of establishing and maintaining adequate advisory systems. Perhaps if faculty were more involved in the process as teachers there would be less need for costly and time-consuming formal advisory structures.

A final requirement of an elective program is that it incorporate a system of self-evaluation. Objective or descriptive data on the working

of the program must be collected if its strengths are to be appreciated and its weaknesses corrected. Robert Beran, in reference to the rapid rise and equally rapid fall of the three-year medical curriculum, pointed out the consequences of the lack of on-going evaluation of these programs:

It has often been said that educational program experiments never fail because benefits are always derived from the experience. It is also worth considering that the experiments never fail because we do not know whether they succeed. (165)

For example, at Yale, where the elective program is extremely liberal and evaluation of either student performance or elective course quality has been virtually impossible, both faculty and students have recently expressed the idea that a more structured elective system might be desirable. Proposals range from the idea of resurrecting the "tract" system to that of maintaining the present format and simply encouraging faculty to invent course offerings directed specifically at fourth-year students, recognizing openly their particular educational and professional needs and interests. While the desire to improve the elective year is commendable, it must be noted that the value of the present system has been called into question in the absence of any evidence provided by an evaluation process. Until this has been done, in at least a minimal, subjective fashion, any changes made cannot be described as improvements with any justification. To say that the fourth year should be made "a more worthwhile educational experience" (166) assumes that its present worth has been at least relatively determined. Those involved in the process of appraising the fourth year and recommending changes must decide what they want to use as a measure of the quality of the elective program before they alter the present system

significantly. Unless this is done, the value of the changes will not be determinable. Yale would certainly not be the first institution to encounter this pitfall, but awareness at least offers the possibility of its avoidance.

So, by meeting a few basic requirements, none of which are uncommonly strict, a successful elective system can be imagined. It has the potential of making a medical student's undergraduate experience more individual and it offers opportunities to develop the essential capacity for self-education. In theory, a student would use this time to investigate areas of interest under the guidance of faculty members, using the full extent of university and medical school resources. The goals of such a program are not controversial and the means are not mysterious. However, elective programs have lacked strong and consistent advocates of their value. Unlike the other two components of the undergraduate medical curriculum, the basic science core and the clinical clerkships, which are relatively uniform and self-perpetuating, the elective system, because it is unique to each student, requires constant attention and extensive faculty involvement. Such attitudes however, do not really fit with traditions that have been established in American medical education. A legacy of the Flexner Report is the attitude on the part of medical educators and the public that such an educational catharsis will occur again if the conditions are bad enough to warrant it. This is a naive hope, for medical education is too large and too powerful to be vigorously shaken up and whipped into shape by an influential outsider or a prestigious organization. The means of retaining and renewing the quality of medical education lie only within the system itself. However, the required leadership is sadly lacking. A medical

professional can find greater rewards for efforts in research or practice than for efforts devoted to medical education. It is unfortunate that the creativity and determination with which the medical profession is so amply supplied have not been applied to solving the problems of medical education.

At the present time, the medical education system faces many external and internal challenges. Increases in educational costs, an ambiguous physician manpower situation, and the widespread, vaguely expressed sentiment that schools are not turning out the type of physician needed have caused medical schools to re-examine their goals. The improvements in educational methods demanded by Flexner seem to have been forgotten. Laboratory experience has all but vanished, didactic methods convey much of the factual content, and the traditional practical value of the clinical clerkship is being eroded by the assumption of many of the medical students' responsibilities by hospital-paid para-professionals. Medical school admissions and professional licensure are largely determined by standardized, multiple-choice tests of questionable appropriateness to medicine.

It cannot be claimed that a proper elective program could begin to solve such problems as these. However, by encouraging initiative in students, and by challenging faculty to make the necessary efforts in teaching, elective programs can help prevent medical education from becoming static, inflexible, and purely vocational in nature. If an elective program can assure this, then it will have done enough.

At the present time, an Association of American Medical Colleges study of the totality of medical education is underway. Although its working agenda includes little specific consideration of electives, it

does recognize that the capacity for independent learning is a fundamental medical skill. (167) More significantly, this study has adopted two basic principles which have been missing from all previous studies. First of all, it is attempting to study the entirety of medical education and not just the medical school period. One hopes that the conflicts which exist between the university and professional phases of medical education will be identified and reforms will be suggested. Most importantly, the A.A.M.C. study has recognized the medical faculties as its proper audience, identifying them as being responsible for student selection, teaching, and the general tone of medical education. (168) Whatever the specifics of the report will be, it is important to note that at least the proper group is being addressed. Much of the existing literature in medical education is not really directed toward any group, so its impact has been minimal. One hopes that the new A.A.M.C. report will initiate an involvement in the investigation of the educational process by those who are most essential to it. Just as the medical faculty has been shown to be the essence of a successful elective program, so will they be recognized as the basis for the success or failure of medical education in general.

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